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EXAMINER

HENN, TIMOTHY J

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2612

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/475,487

Applicant(s)

ASSADI, AZAR

Examiner

Timothy J Henn

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Please note that the examiner of record has changed. All future correspondence should be directed to Timothy J. Henn whose information is provided at the end of this office action.

Response to Arguments

2. In view of the appeal brief filed on 07 July 2004, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Applicant's arguments filed 13 July 2004 have been fully considered but they are not persuasive. In the arguments with regard to claims 17-26 applicant argues that the only motivation for combining Gal with a second reference is to separate colors. The examiner notes that this motivation has again been used below to combine the Gal reference with Thiel et al. However, since Thiel makes no mention of how color imaging can be performed, including the Gal reference in order to separate light into color bands

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is considered to be an appropriate motivation and is thought to establish a proper case of prima facie obviousness as dictated by 35 U.S.C. §103(a) and MPEP §2143.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Theil et al. (US 6,114,739) in view of Rostoker (US 5,760,834).

[claim 1]

Regarding claim 1, Theil discloses an integrated pixel sensor structure (Figure 2) comprising: a light sensitive diode (Figure 2, Items 44, 46 and 48) including a transparent conductor (Figure 2, Item 50). However, Theil lacks a protective layer placed above the transparent conductor, the protective layer including a set of diffraction grating elements for producing complementary colors.

Rostoker teaches that by placing elements including a LCD panel (Figure 16B, Item 1630) and a binary optic element or "diffraction grating element" (Figure 16B, Item 1610) over an image sensing array (Figure 16B, Item 1620) a sandwiched display/image sensor (c. 13, ll. 40-65; c. 14, ll. 23-39) capable of color imaging (c. 10, ll. 9-43) is formed. The examiner notes that the combination of Rostoker's LCD panel and binary optic element placed above an image sensing array inherently form a protective layer including a set of diffraction grating elements as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

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include a "protective layer" including a LCD panel and binary optic element as taught by Rostoker to create a combination display/image sensor capable of color imaging.

[claim 2]

Regarding claim 2, Thiel in view of Rostoker lacks a protective layer including anti-reflection properties. Official Notice is taken that the use of anti-reflection layers in image sensors is notoriously well known to improve the efficiency of the image sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include anti-reflection properties in the protective layer of Thiel in view of Rostoker to improve the efficiency of the image sensor.

[claim 3]

Regarding claim 3, Rostoker discloses the use of imaging devices such as CCD arrays or "any other suitable device which changes state or generates a potential or potential difference upon incidence of light" (c. 5, ll. 5-26). Thiel discloses an image sensor that is compatible with a metal oxide semiconductor (MOS) fabrication process and which generates charges representative of the intensity of incident light (c. 3, ll. 27-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use materials which are compatible with MOS fabrication processes for construction of the protective layer of Rostoker when using "any other suitable device which changes state or generates a potential or potential difference upon incidence of light" such as MOS image sensors.

[claim 4]

Regarding claim 4, Rostoker discloses binary diffractive optics as discussed in the article "Binary Optics" by Veldkamp et al. and incorporates the "Binary Optics" article by reference (c. 1, ll. 34-36). It is noted that Veldkamp discloses the use of four step echelon grating elements (Page 95, Column 1) as claimed.

[claim 5]

In regard to claim 5, Theil disclose a system comprising: an integrated pixel sensor structure (Figure 2) comprising: a light sensitive diode (Figure 2, Items 44, 46 and 48) including a transparent conductor (Figure 2, Item 50) and a post capture signal processing unit coupled to the integrated pixel sensor (c. 3, ll. 9-10). However, Theil lacks a protective layer placed above the transparent conductor, the protective layer including a set of diffraction grating elements for producing complementary colors.

Rostoker teaches that by placing elements including a LCD panel (Figure 16B, Item 1630) and a binary optic element or "diffraction grating element" (Figure 16B, Item 1610) over an image sensing array (Figure 16B, Item 1620) a sandwiched display/image sensor (c. 13, ll. 40-65; c. 14, ll. 23-39) capable of color imaging (c. 10, ll. 9-43) is formed. The examiner notes that the combination of Rostoker's LCD panel and binary optic element placed above an image sensing array inherently form a protective layer including a set of diffraction grating elements as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a "protective layer" including a LCD panel and binary optic element as taught by Rostoker to create a combination display/image sensor capable of color imaging.

[claim 6]

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Regarding claim 6, Theil in view of Rostoker lacks a protective layer including anti-reflection properties. Official Notice is taken that the use of anti-reflection layers in image sensors is notoriously well known to improve the efficiency of the image sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include anti-reflection properties in the protective layer of Theil in view of Rostoker to improve the efficiency of the image sensor.

[claim 7]

Regarding claim 7, Rostoker discloses the use of spin-on glass or "sol-gel" (c. 5, ll. 47-51; c. 9, ll. 58-66; c. 13, ll. 20-65).

[claim 8]

Regarding claim 8, Rostoker discloses binary diffractive optics as discussed in the article "Binary Optics" by Veldkamp et al. and incorporates the "Binary Optics" article by reference (c. 1, ll. 34-36). It is noted that Veldkamp discloses the use of four step echelon grating elements (Page 95, Column 1) as claimed.

[claim 9]

Regarding claim 9, Theil discloses an apparatus (Figure 9) comprising: a light sensitive means (Figure 2, Items 44, 46 and 48) and a transparent conductor means displaced above the light sensitive means (Figure 2, Item 50). However, Theil lacks a protective layer means placed above the transparent conductor means, the protective layer means including a set of diffraction grating means for producing complementary colors.

Rostoker teaches that by placing elements including a LCD panel (Figure 16B, Item 1630) and a binary optic element or "diffraction grating element" (Figure 16B, Item 1610) over an image sensing array (Figure 16B, Item 1620) a sandwiched display/image sensor (c. 13, ll. 40-65; c. 14, ll. 23-39) capable of color imaging (c. 10, ll. 9-43) is formed. The examiner notes that the combination of Rostoker's LCD panel and binary optic element placed above an image sensing array inherently form a protective layer including a set of diffraction grating elements as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a "protective layer" including a LCD panel and binary optic element as taught by Rostoker to create a combination display/image sensor capable of color imaging.

[claim 10]

Regarding claim 10, Theil in view of Rostoker lacks a protective layer including anti-reflection properties. Official Notice is taken that the use of anti-reflection layers in image sensors is notoriously well known to improve the efficiency of the image sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include anti-reflection properties in the protective layer of Theil in view of Rostoker to improve the efficiency of the image sensor.

[claim 11]

In regard to claim 11, Rostoker discloses the use of imaging devices such as CCD arrays or "any other suitable device which changes state or generates a potential or potential difference upon incidence of light" (c. 5, ll. 5-26). Thiel discloses an image sensor that is compatible with a metal oxide semiconductor (MOS) fabrication process

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and which generates charges representative of the intensity of incident light (c. 3, ll. 27-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use materials which are compatible with MOS fabrication processes for construction of the protective layer of Rostoker when using "any other suitable device which changes state or generates a potential or potential difference upon incidence of light" such as MOS image sensors.

[claim 12]

Regarding claim 12, Rostoker discloses binary diffractive optics as discussed in the article "Binary Optics" by Veldkamp et al. and incorporates the "Binary Optics" article by reference (c. 1, ll. 34-36). It is noted that Veldkamp discloses the use of four step echelon grating elements (Page 95, Column 1) as claimed.

[claims 13-16]

Claims 13-16 are method claims corresponding to apparatus claims 9-12. Therefore, claims 13-16 are analyzed and rejected as previously discussed with respect to claims 9-12.

5. Claims 17-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thiel et al. (US 6,114,739) in view of Gal et al (US 5,600,486).

[claim 17]

Regarding claim 17, Thiel discloses an integrated circuit die (Figure 2) comprising: an image sensing area of the die having a plurality of light-sensitive diodes (Figure 2, Items 44, 46 and 48) formed above a metallization layer of the die (Figure 2,

Items 45). However Thiel lacks a protective layer, wherein the protective layer is shaped as a diffraction grating.

Gal discloses a protective layer placed above a substrate wherein the protective layer protects the substrate and is shaped as a diffraction grating (Figure 2). Gal discloses the use of this diffraction grating to separate light into color spots for a camera on a chip (c. 2, ll. 1-7). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the protective layer of Gal in the camera of Rostoker to separate light into its respective colors for creation of color images.

[claim 18]

Regarding claim 18, Thiel discloses a plurality of diodes having amorphous silicon as their photoactive material (Figure 2, Item 46).

[claim 19]

Regarding claim 19, Thiel discloses a plurality of diodes having a n-i-p structure (Figure 2, Items 44, 46 and 48).

[claim 20]

Regarding claim 20, Thiel discloses n and p layers which are thin relative to the i portion (Figure 2).

[claim 21]

Regarding claim 21, Thiel discloses a plurality of diodes having a transparent conductor made of an ITO layer that forms a top contact of the plurality of diodes

(Figure 2, Item 50; c. 5, ll. 38-45).

[claim 22]

Regarding claim 22, Thiel in view of Gal discloses placement of a protective layer above a transparent conductor. The examiner notes that in order for such a device to be manufactured the protective layer must inherently have a low enough deposition temperature so as not to environmentally stress the transparent conductor.

[claim 23]

Regarding claim 23, Thiel in view of Gal lacks a protective layer including anti-reflection properties. Official Notice is taken that the use of anti-reflection layers in image sensors is notoriously well known to improve the efficiency of the image sensors. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include anti-reflection properties in the protective layer of Thiel in view of Rostoker to improve the efficiency of the image sensor.

[claim 24]

Regarding claim 24, Gal discloses a diffraction grating designed to impart RGB color sensing to the image sensing area of the die (Figure 2; c. 11, ll. 6-10).

[claim 25]

Regarding claim 25, Gal does not disclose the material of construction for the protective layer. Official Notice is taken that it is well known in the art to use sol-gel materials for the creation of integrated optic devices to be included with semiconductor chips. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a sol-gel as a suitable material for the creation of

the protective layer of Thiel in view of Gal.

[claim 26]

Regarding claim 3, Thiel discloses an image sensor which is formed on a CMOS substrate (i.e. is compatible with MOS fabrication processes). Gal does not disclose the method of construction of his protective layer. However, Official Notice is taken that the use of semiconductor fabrication processes for the production of integrated optics for semiconductor devices is notoriously well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a MOS fabrication process in the creation of the integrated optics of Thiel in view of Gal since the device of Thiel is created using MOS fabrication processes.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following prior art further shows the current state of the art in diffractive optics:

- i. "Binary Optics", Scientific American, May 1992, pages 92-97

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J Henn whose telephone number is (703) 305-8327. The examiner can normally be reached on M-F 9:00 AM - 6:00 PM.

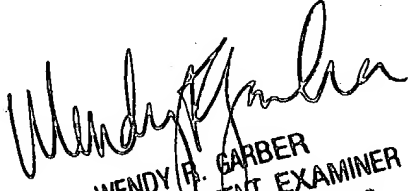
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy R Garber can be reached on (703) 305-4929. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TJH
12/20/2004


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